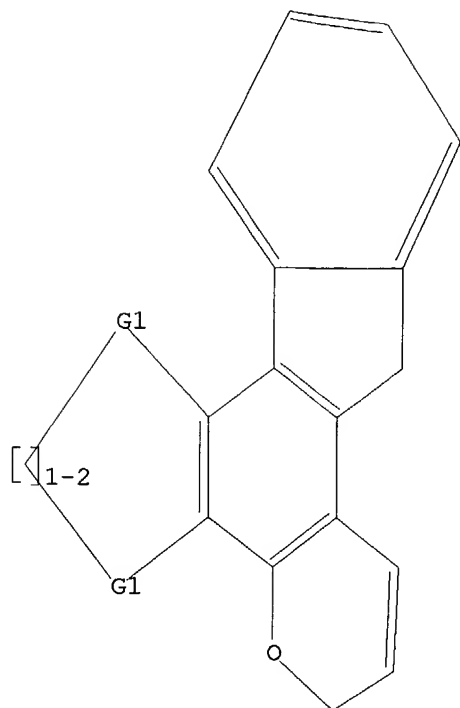


7/12/2004

L1 HAS NO ANSWERS

L1 STR



G1 C,O,S,N

s 12

L3 73 L2

=> s 13 and photochromic

9818 PHOTOCHROMIC

48 PHOTOCHROMICS

9824 PHOTOCHROMIC

(PHOTOCHROMIC OR PHOTOCHROMICS)

L4 48 L3 AND PHOTOCHROMIC

=> s 14 and chromene

1589 CHROMENE

769 CHROMENES

1861 CHROMENE

(CHROMENE OR CHROMENES)

L5 16 L4 AND CHROMENE

=> d 15 1-16 iall

L5 ANSWER 1 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2004:493798 CAPLUS

ENTRY DATE: Entered STN: 18 Jun 2004

TITLE: Coating composition and optical article

INVENTOR(S): Mori, Katsuhiko; Momoda, Junji

PATENT ASSIGNEE(S): Tokuyama Corporation, Japan

SOURCE: PCT Int. Appl., 100 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

INT. PATENT CLASSIF.:

MAIN: C09D004-00

SECONDARY: C09D007-12; C09K009-02; C08J007-04; G02B005-23;  
G02C007-10  
CLASSIFICATION: 63-7 (Pharmaceuticals)  
Section cross-reference(s): 38, 73  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

| PATENT NO.  | KIND | DATE     | APPLICATION NO. | DATE       |
|---|------|----------|-----------------|------------|
| WO 2004050775   | A1   | 20040617 | WO 2003-JP15558 | 20031204   |
| W: AU, JP, US   |      |          |                 |            |
| RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE,<br>IT, LU, MC, NL, PT, RO, SE, SI, SK, TR |      |          |                 |            |
| PRIORITY APPLN. INFO.:  |      |          | JP 2002-354291  | A 20021205 |
|   |      |          | JP 2002-372835  | A 20021224 |

ABSTRACT:

Disclosed is a coating composition which, when applied to a substrate such as a plastic lens, can form on the substrate surface a **photochromic** coating layer having satisfactory photochromism and excellent adhesion to the substrate. The composition contains as monomer ingredients, for example, 0.1-20 % monomer having a group which generates a silanol group upon hydrolysis, such as  $\gamma$ -methacryloyloxypropyltrimethoxysilane and 0.1-50 % monomer having at least one oxycarbonyl group per mol. A maleimide compound may be further contained as other monomer ingredient. More desirably, the composition contains an amine compound. A coating composition containing  $\gamma$ -methacryloyloxypropyltrimethoxysilane, trimethylolpropanetrimethacrylate, polyethylene glycol diacrylate, urethane oligomer hexaacrylate (U-6HA), glycidyl methacrylate, hydroxyphenylacetic acid neopentylglycol diacrylate, N-methyldiethanolamine, a polymerization initiator, a stabilizer, and a **chromene** compound, was formulated, and applied on a thiourethane-based plastic lens.

SUPPL. TERM: **photochromic** coating material plastic lens  
INDEX TERM: Plastics  
ROLE: BUU (Biological use, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); THU (Therapeutic use); BIOL (Biological study); PROC (Process); USES (Uses)  
(allyl; **photochromic** coating composition for optical article)

INDEX TERM: **Photochromic** materials  
(eyeglass lenses; **photochromic** coating composition for optical article)

INDEX TERM: Optical materials  
(**photochromic** coating composition for optical article)

INDEX TERM: Acrylic polymers  
Polyurethanes  
ROLE: BUU (Biological use, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); THU (Therapeutic use); BIOL (Biological study); PROC (Process); USES (Uses)  
(**photochromic** coating composition for optical article)

INDEX TERM: Coating materials  
Eyeglass lenses  
(**photochromic**; **photochromic** coating composition for optical article)

INDEX TERM: Lenses  
(plastic; **photochromic** coating composition for optical article)

INDEX TERM: Polyurethanes  
ROLE: BUU (Biological use, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); THU (Therapeutic use); BIOL (Biological study); PROC (Process); USES (Uses)  
(thio-; **photochromic** coating composition for optical article)

INDEX TERM: Epoxy resins  
ROLE: BUU (Biological use, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); THU (Therapeutic use); BIOL (Biological study); PROC (Process); USES (Uses)  
(thio; **photochromic** coating composition for optical article)

INDEX TERM: 705967-98-2P 705967-99-3P 705968-00-9P 705968-01-0P  
705968-02-1P 705968-03-2P 705968-04-3P 705968-05-4P  
705968-06-5P 705968-07-6P 705968-08-7P 705968-09-8P  
705968-10-1P 705968-11-2P 705968-12-3P 705968-13-4P  
705968-14-5P 705968-16-7P 705968-17-8P 705968-18-9P  
705968-19-0P 705968-20-3P 705968-21-4P 705968-32-7P  
ROLE: BUU (Biological use, unclassified); SPN (Synthetic preparation); TEM (Technical or engineered material use); THU (Therapeutic use); BIOL (Biological study); PREP (Preparation); USES (Uses)

(**photochromic** coating composition for optical article)  
INDEX TERM: 308283-12-7 308283-35-4 312969-97-4  
321861-35-2 356061-14-8 378235-36-0  
682811-95-6 682811-96-7  
ROLE: BUU (Biological use, unclassified); TEM (Technical or engineered material use); THU (Therapeutic use); BIOL (Biological study); USES (Uses)  
(**photochromic** coating composition for optical article)

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD.

REFERENCE(S): (1) Lintec Corp; JP 04-65481 A 1992 CAPLUS  
(2) Lintec Corp; EP 467552 A1 1992 CAPLUS  
(3) Tokuyama Corp; WO 01005854 A1 2001  
(4) Tokuyama Corp; EP 1130038 A1 2001 CAPLUS  
(5) Tokuyama Corp; WO 0228930 A1 2002  
(6) Tokuyama Corp; EP 1293522 A1 2002 CAPLUS  
(7) Tokuyama Corp; JP 2002105139 A 2002 CAPLUS  
(8) Tokuyama Corp; WO 03011967 A1 2003 CAPLUS

L5 ANSWER 2 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2003:945459 CAPLUS

DOCUMENT NUMBER: 140:5601

ENTRY DATE: Entered STN: 04 Dec 2003

TITLE: Polymerizable compositions with good storage stability and their **photochromic** polymers

INVENTOR(S): Izumi, Shinobu; Mori, Chikahiro; Hyakuta, Junji

PATENT ASSIGNEE(S): Tokuyama Corp., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 12 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

INT. PATENT CLASSIF.:

MAIN: C08F002-44

SECONDARY: C08F020-30; C08F290-06; G03C001-73

CLASSIFICATION: 37-3 (Plastics Manufacture and Processing)  
Section cross-reference(s): 73, 74

FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

| PATENT NO.    | KIND | DATE     | APPLICATION NO. | DATE     |
|---------------|------|----------|-----------------|----------|
| JP 2003342310 | A2   | 20031203 | JP 2002-153597  | 20020528 |

PRIORITY APPLN. INFO.: JP 2002-153597 20020528

ABSTRACT:

Title compns. comprise (A) **photochromic** compds. and (B) radically polymerizable monomers (viscosity  $\geq 60$  cP at 25°) containing  $\geq 45\%$  monomers having aromatic groups. Thus, a composition containing 2,2-bis(4-methacryloyloxyethoxyphenyl)propane, glycidyl methacrylate, trimethylolpropane trimethacrylate, EB 1830 (polyester oligomer hexaacrylate), polyethylene glycol diacrylate, and a **photochromic** mol. compound of \*\*\*chromene\*\*\* derivative and toluene showed no deposition of the \*\*\*photochromic\*\*\* compound for 42 h at 40°. Then, the composition was applied on a plastic lens and irradiated with a metal halide lamp to give a test piece showing good **photochromic** property.

SUPPL. TERM: **photochromic** polymerizable compn storage stability; lens **photochromic** polymerizable coating storage stability

INDEX TERM: Polyoxyalkylenes, preparation  
ROLE: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses) (acrylic-polyester-; polymerizable compns. with good storage stability for **photochromic** polymers)

INDEX TERM: Polyesters, preparation  
ROLE: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses) (acrylic-polyoxyalkylene-; polymerizable compns. with good storage stability for **photochromic** polymers)

INDEX TERM: Polyoxyalkylenes, preparation  
ROLE: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses) (acrylic; polymerizable compns. with good storage stability for **photochromic** polymers)

INDEX TERM: Lenses  
**Photochromic** materials (polymerizable compns. with good storage stability for **photochromic** polymers)

INDEX TERM: 628290-18-6P 628290-19-7P 628290-20-0P 628290-21-1P 628290-22-2P 628297-96-1P  
ROLE: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses) (polymerizable compns. with good storage stability for **photochromic** polymers)

INDEX TERM: **628290-23-3** 628290-24-4  
ROLE: TEM (Technical or engineered material use); USES (Uses) (polymerizable compns. with good storage stability for **photochromic** polymers)

L5 ANSWER 3 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2003:931453 CAPLUS

DOCUMENT NUMBER: 139:401382

ENTRY DATE: Entered STN: 28 Nov 2003

TITLE: **Photochromic** composite containing aromatic **chromene**

INVENTOR(S): Nagoh, Hironobu; Momoda, Junji

PATENT ASSIGNEE(S): Tokuyama Corporation, Japan

SOURCE: PCT Int. Appl., 81 pp.  
 CODEN: PIXXD2  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 INT. PATENT CLASSIF.:  
     MAIN: C09K009-02  
     SECONDARY: C09D004-00; C09D201-00; C09D007-12; C08L101-00;  
                 C08K005-3432; C08K005-1545; C07D311-78; G02C007-10;  
                 G02B001-04  
 CLASSIFICATION: 73-11 (Optical, Electron, and Mass Spectroscopy and  
                     Other Related Properties)  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

| PATENT NO.   | KIND  | DATE     | APPLICATION NO. | DATE     |
|--|---|----------|-----------------|----------|
| -----  | ---   | -----    | -----           | -----    |
| WO 2003097765  | A1  | 20031127 | WO 2002-JP4947  | 20020522 |
| W: AU, JP, US  |   |          |                 |          |
| RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL,<br>PT, SE, TR  |   |          |                 |          |
| PRIORITY APPLN. INFO.:   |   |          | WO 2002-JP4947  | 20020522 |
| ABSTRACT:  |   |          |                 |          |
| The invention refers to a <b>photochromic</b> composite or coating<br>comprising 0.01 - 20 unit wts. of a <b>chromene</b> compound and an aromatic<br>compound in 100 unit wts. of a radical monomer or polymer. |   |          |                 |          |
| SUPPL. TERM:   | <b>photochromic</b> material optical coating lens   |          |                 |          |
| INDEX TERM:  | <b>chromene</b> arom<br>Lenses<br>Optical films<br><b>Photochromic</b> materials<br>( <b>photochromic</b> composite containing aromatic<br><b>chromene</b> )  |          |                 |          |
| INDEX TERM:  | 116958-66-8, NK Oligo U 6HA 146479-65-4, Ebecryl 1830<br>214746-73-3 <b>321861-35-2 356061-14-8</b><br><b>378235-33-7</b> 378235-36-0 521272-61-7<br>626244-04-0, Polyethylene glycol diacrylate-glycidyl<br>methacrylate copolymer 626244-05-1, Polyethylene glycol<br>diacrylate-glycidyl methacrylate-divinylbenzene copolymer<br>626244-06-2 626244-08-4 626244-10-8<br>ROLE: DEV (Device component use); USES (Uses)<br>( <b>photochromic</b> composite containing aromatic<br><b>chromene</b> ) |          |                 |          |
| INDEX TERM:  | <b>308283-35-4P</b> 312969-97-4P<br>ROLE: DEV (Device component use); SPN (Synthetic<br>preparation); PREP (Preparation); USES (Uses)<br>( <b>photochromic</b> composite containing aromatic<br><b>chromene</b> )   |          |                 |          |
| INDEX TERM:  | 159596-05-1 194940-93-7 308283-44-5 312969-84-9<br>ROLE: RCT (Reactant); RACT (Reactant or reagent)<br>( <b>photochromic</b> composite containing aromatic<br><b>chromene</b> )   |          |                 |          |
| REFERENCE COUNT:   | 3 THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS<br>RECORD.  |          |                 |          |
| REFERENCE(S):  | (1) Tokuyama Corp; JP 200111066 A 2001<br>(2) Tokuyama Corp; JP 2001114775 A 2001 CAPLUS<br>(3) Tokuyama Corp; JP 2002161269 A 2002 CAPLUS  |          |                 |          |

L5 ANSWER 4 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN  
 ACCESSION NUMBER: 2003:349318 CAPLUS  
 DOCUMENT NUMBER: 138:370386  
 ENTRY DATE: Entered STN: 08 May 2003

TITLE: **Photochromic** photocurable coating materials with good storage stability and **photochromic** eyeglass lenses therefrom

INVENTOR(S): Hyakuta, Junji; Kuwahara, Eiko

PATENT ASSIGNEE(S): Tokuyama Corp., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 13 pp.  
CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

INT. PATENT CLASSIF.:  
MAIN: C08F002-44  
SECONDARY: C08F002-48; C09D004-00; G02B001-10; G02B005-23;  
G02C007-10; C09D005-00

CLASSIFICATION: 42-10 (Coatings, Inks, and Related Products)  
Section cross-reference(s): 63, 73

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO.             | KIND | DATE     | APPLICATION NO. | DATE     |
|------------------------|------|----------|-----------------|----------|
| JP 2003128713          | A2   | 20030508 | JP 2001-319944  | 20011017 |
| PRIORITY APPLN. INFO.: |      |          | JP 2001-319944  | 20011017 |

ABSTRACT:

The coating materials comprise (A) base precursors capable of releasing bases upon photo irradiation, (B) radically polymerizable monomers comprising epoxy-containing monomers, and (C) **photochromic** compds. Thus, a composition comprising 2,2-bis[4-(acryloyloxypolyethylene glycol)phenyl]propane, Ebecryl EB 1830 (polyester acrylate), glycidyl methacrylate, polyethylene glycol diacrylate, trimethylolpropane trimethacrylate,  $\gamma$ -methacryloyloxypropyl trimethoxysilane, a **chromene photochromic** dye, and PhCH<sub>2</sub>CO<sub>2</sub>N:CMepH, showing good storage stability, was applied on a plastic lens and photocured to give a coating showing maximum absorption wavelength 610 nm and good peel strength.

SUPPL. TERM: eyeglass lens **photochromic** coating acrylic polyoxyalkylene polyester; storage stable **photochromic** coating oxime base precursor; polyester acrylate glycidyl methacrylate coating **chromene photochromic** dye

INDEX TERM: Polyesters, uses  
ROLE: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)  
(acrylate-terminated, polymers with acrylic monomers; **photochromic** photocurable coatings with good storage stability for eyeglass lenses)

INDEX TERM: Polyoxyalkylenes, uses  
ROLE: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)  
(acrylic-polyester-; **photochromic** photocurable coatings with good storage stability for eyeglass lenses)

INDEX TERM: Polyesters, uses  
ROLE: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)  
(acrylic-polyoxyalkylene-; **photochromic** photocurable coatings with good storage stability for eyeglass lenses)

INDEX TERM: Oximes  
Urethanes  
ROLE: CAT (Catalyst use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)  
(base precursors; **photochromic** photocurable coatings with good storage stability for eyeglass lenses)

INDEX TERM: **Photochromic** materials  
(dyes; **photochromic** photocurable coatings with good storage stability for eyeglass lenses)

INDEX TERM: **Photochromic** materials  
(eyeglass lenses; **photochromic** photocurable coatings with good storage stability for eyeglass lenses)

INDEX TERM: Coating materials  
(**photochromic**, storage-stable; **photochromic** photocurable coatings with good storage stability for eyeglass lenses)

INDEX TERM: Dyes  
Eyeglass lenses  
(**photochromic**; **photochromic** photocurable coatings with good storage stability for eyeglass lenses)

INDEX TERM: Bases, uses  
ROLE: CAT (Catalyst use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)  
(precursors; **photochromic** photocurable coatings with good storage stability for eyeglass lenses)

INDEX TERM: 30435-66-6 81014-63-3 101283-36-7 138570-07-7  
168697-85-6 174504-21-3 521272-60-6  
ROLE: CAT (Catalyst use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)  
(base precursors; **photochromic** photocurable coatings with good storage stability for eyeglass lenses)

INDEX TERM: **308283-14-9**  
ROLE: TEM (Technical or engineered material use); USES (Uses)  
(**photochromic** dyes; **photochromic** photocurable coatings with good storage stability for eyeglass lenses)

INDEX TERM: 521272-59-3P 521272-61-7P 521272-62-8P  
ROLE: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)  
(**photochromic** photocurable coatings with good storage stability for eyeglass lenses)

L5 ANSWER 5 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2003:149740 CAPLUS

DOCUMENT NUMBER: 139:54273

ENTRY DATE: Entered STN: 27 Feb 2003

TITLE: Unusual UV ( $\lambda_{exc} = 303$  nm) and visible ( $\lambda_{exc} = 574$  nm) activated photochromism of an indeno-fused naphthopyran

AUTHOR(S): Favaro, Gianna; Ortica, Fausto; Romani, Aldo  
CORPORATE SOURCE: Dipartimento di Chimica, Universita di Perugia, Perugia, 06123, Italy

SOURCE: New Journal of Chemistry (2003), 27(3), 639-643  
CODEN: NJCHE5; ISSN: 1144-0546

PUBLISHER: Royal Society of Chemistry

DOCUMENT TYPE: Journal

LANGUAGE: English

CLASSIFICATION: 41-5 (Dyes, Organic Pigments, Fluorescent Brighteners, and Photographic Sensitizers)  
Section cross-reference(s): 73

ABSTRACT:

In this work a completely novel **photochromic** mechanism exhibited by an indeno-fused naphthopyran (**chromene**) is presented. The studied mol. is the first case of a **chromene**-type compound exhibiting both photochromism and thermochromism. These phenomena were investigated in

ethanol. Thermochromism was detected by monitoring absorption spectra in the 285-320 K temperature range: the enthalpy of the thermocoloration reaction was determined ( $\Delta H = 25 \text{ kJ mol}^{-1}$ ) and the equilibrium constant was estimated ( $K_{eq} \approx 10^{-3}$ ). For the photochem. investigation, carried out in the 200-270 K temperature range, continuous monochromatic light was used for excitation. The photocoloration was observed under two distinct stimulations: UV-irradiation ( $\lambda_{exc} = 303 \text{ nm}$ ), which is normally used for **photochromic chromene** activation, and visible-irradiation ( $\lambda_{exc} = 574 \text{ nm}$ ) of the thermally equilibrated solution. Two colored species are involved in the photochem. and thermal processes. One of them, P, is photochem. produced by UV irradiation of the colorless form, while the other, T, is present in thermal equilibrium with the closed form. When the thermally equilibrated solution is irradiated with visible light, T is converted to P. This system not only results in a cyclic on-off chromogenic device which can be switched on by UV radiation, while also exhibiting on-off functionality using lower energy visible light. Such behavior makes this **photochromic** system exceptionally efficient upon exposure to sunlight.

SUPPL. TERM: indeno fused naphthopyran dye photochromism;  
**chromene** dye thermochromism photochromism UV visible  
light activated

INDEX TERM: Photochromism  
(UV and visible light-activated photochromism of  
indeno-fused naphthopyran dye)

INDEX TERM: Fluorescence  
UV and visible spectra  
(in UV and visible light-activated photochromism of  
indeno-fused naphthopyran dye)

INDEX TERM: Thermochromism  
(photochromism and thermochromism of indeno-fused  
naphthopyran dye)

INDEX TERM: **178990-12-0**  
ROLE: PRP (Properties); TEM (Technical or engineered  
material use); USES (Uses)  
(dye; UV and visible light-activated photochromism of  
indeno-fused naphthopyran)

REFERENCE COUNT: 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS  
RECORD.

REFERENCE(S): (1) Favaro, G; J Chem Soc, Faraday Trans 1994, V90, P333  
CAPLUS  
(2) Favaro, G; Mol Cryst Liq Cryst 1997, V298, P137  
(3) Favaro, G; Photochem Photobiol 2000, V72, P632 CAPLUS  
(4) Favaro, G; Proc Indian Acad Sci 1995, V107, P659 CAPLUS  
(5) Joockusch, S; J Phys Chem A 2002, V106, P9236  
(6) Kolc, J; J Phys Chem 1967, V71, P4045 CAPLUS  
(7) Lin, J; US 5869658 A 1999 CAPLUS  
(8) Nelson, C; WO 0119813 A1 2001 CAPLUS  
(9) Ortica, F; Photochem Photobiol Sci 2002, V1, P803 CAPLUS  
(10) Samat, A; Organic Photochromic and Thermochromic  
Compounds, ch 10 1999, V2  
(11) van Gemert, B; Mol Cryst Liq Cryst 1997, V297, P131  
CAPLUS  
(12) van Gemert, B; Organic Photochromic and Thermochromic  
Compounds, ch 3 1999, V1

L5 ANSWER 6 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN  
ACCESSION NUMBER: 2002:758662 CAPLUS  
DOCUMENT NUMBER: 138:138763  
ENTRY DATE: Entered STN: 07 Oct 2002  
TITLE: Effects of the environment on the **photochromic**  
behaviour of a novel indeno-fused naphthopyran



AUTHOR(S): Ortica, Fausto; Romani, Aldo; Blackburn, Forrest;  
 Favaro, Gianna  
 CORPORATE SOURCE: Dipartimento di Chimica, Universita di Perugia,  
 Perugia, 06123, Italy  
 SOURCE: Photochemical & Photobiological Sciences (2002),  
 1(10), 803-808  
 CODEN: PPSHCB; ISSN: 1474-905X  
 PUBLISHER: Royal Society of Chemistry  
 DOCUMENT TYPE: Journal  
 LANGUAGE: English  
 CLASSIFICATION: 41-11 (Dyes, Organic Pigments, Fluorescent  
 Brighteners, and Photographic Sensitizers)  
 Section cross-reference(s): 27, 73

ABSTRACT:

The photochromism of 3,3-bis(4-methoxyphenyl)-6,11,13-trimethyl-3,13-dihydrobenzo[3,4]fluoreno[2,1-b]pyran-13-ol, a new **chromene**-type indeno-fused naphthopyran, was studied under steady irradiation in solvents of different polarity and/or proticity, in microheterogeneous systems (micelles and gel) and in a nematic liquid crystal. The solns. change from colorless to colored upon UV irradiation, due to cleavage of the carbon-oxygen pyran bond. The photoreaction is thermally reversible. Spectra, molar absorption coeffs. of the colorless and colored forms, quantum yield of photocoloration, and kinetic parameters of the thermal bleaching (rate constant and activation energy) were determined. Compared with other **chromenes**, the spectra of both the colored and colorless forms are red-shifted and the colored form exhibits a marked pos. solvatochromism. The photocolorability is good, even at ambient temperature, and is better in a polar and/or protic medium where the entropy loss due to solvent reorganization around the transition state decreases the rate of the bleaching process. Thus, the best media for coloration are ethanol and E49 liquid crystals. In the gel and microemulsion the non-polar ground state mols. (in both the open and closed forms) occupy the hydrophobic sites and therefore the behavior is similar to that observed in isooctane.

SUPPL. TERM: photochromism indenonaphthopyran **chromene** dye  
 surrounding medium effect  
 INDEX TERM: Photochromism  
 (effects of environment on **photochromic**  
 behavior of indeno-fused naphthopyran dye)  
 INDEX TERM: Solvatochromism  
 Tautomerization kinetics  
 UV and visible spectra  
 (in effects of environment on **photochromic**  
 behavior of indeno-fused naphthopyran dye)  
 INDEX TERM: Micelles  
 (**photochromic** behavior of indeno-fused  
 naphthopyran dye in)  
 INDEX TERM: Gelatins, uses  
 ROLE: NUU (Other use, unclassified); USES (Uses)  
 (**photochromic** behavior of indeno-fused  
 naphthopyran dye in)  
 INDEX TERM: Tautomers  
 (phototautomerism; in effects of environment on  
**photochromic** behavior of indeno-fused  
 naphthopyran dye)  
 INDEX TERM: Tautomers  
 (ring-chain; in effects of environment on  
**photochromic** behavior of indeno-fused  
 naphthopyran dye)  
 INDEX TERM: **178990-12-0**  
 ROLE: PRP (Properties); TEM (Technical or engineered  
 material use); USES (Uses)  
 (effects of environment on **photochromic**

behavior of indeno-fused naphthopyran dye)  
INDEX TERM: 64-17-5, Ethanol, uses 540-84-1, Isooctane 40817-08-1, E49  
ROLE: NUU (Other use, unclassified); USES (Uses)  
(photochromic behavior of indeno-fused naphthopyran dye in)  
REFERENCE COUNT: 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD.  
REFERENCE(S): (1) Becker, R; J Am Chem Soc 1999, V121, P2104 CAPLUS  
(2) Becket, R; J Am Chem Soc 1966, V88, P5931  
(3) Borderie, B; J Phys Chem 1992, V96, P2953 CAPLUS  
(4) Favaro, G; J Chem Soc, Faraday Trans 1994, V90, P333 CAPLUS  
(5) Favaro, G; J Photochem Photobiol A 1995, V87, P235 CAPLUS  
(6) Favaro, G; J Photochem Photobiol, A 2001, V140/3, P229  
(7) Favaro, G; Mol Cryst Liq Cryst 1997, V298, P137  
(8) Favaro, G; Photochem Photobiol 2000, V72, P632 CAPLUS  
(9) Favaro, G; Photochem Photobiol 2001, V74, P378 CAPLUS  
(10) Gauglitz, G; J Photochem Photobiol, A 1993, V71, P205 CAPLUS  
(11) Ichimura, K; Photochromism. Molecules and systems 1990, P903 CAPLUS  
(12) Kalyanasundaram, K; Photochemistry in Microheterogeneous Systems 1987  
(13) Kolc, J; J Phys Chem 1967, V71, P4045 CAPLUS  
(14) Lenoble, C; J Photochem 1986, V33, P187 CAPLUS  
(15) Ortica, F; J Phys Chem B 2000, V104, P12179 CAPLUS  
(16) Ottavi, G; Int J Chem Kinet 1999, V31, P303 CAPLUS  
(17) Quellet, C; Chimia 1986, V40, P233 CAPLUS  
(18) Quellet, C; J Phys Chem 1991, V95, P5642 CAPLUS  
(19) Sun, X; Mol Cryst Liq Cryst 1997, V297, P57 CAPLUS  
(20) Van Gemert, B; Organic Photochromic and Thermochromic Compounds 1998, V1

L5 ANSWER 7 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:423033 CAPLUS

DOCUMENT NUMBER: 137:13029

ENTRY DATE: Entered STN: 05 Jun 2002

TITLE: **Photochromic chromene** compounds, **photochromic** optical materials, their manufacture, and **photochromic** lenses

INVENTOR(S): Nago, Hironobu; Hyakuta, Junji

PATENT ASSIGNEE(S): Tokuyama Corp., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 14 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

INT. PATENT CLASSIF.:

MAIN: C09K009-02

SECONDARY: G03C001-73

CLASSIFICATION: 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)

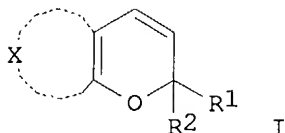
Section cross-reference(s): 27

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO.             | KIND | DATE             | APPLICATION NO. | DATE     |
|------------------------|------|------------------|-----------------|----------|
| JP 2002161269          | A2   | 20020604         | JP 2000-360687  | 20001128 |
| PRIORITY APPLN. INFO.: |      |                  | JP 2000-360687  | 20001128 |
| OTHER SOURCE(S):       |      | MARPAT 137:13029 |                 |          |

GRAPHIC IMAGE:



ABSTRACT:

**Photochromic** materials that are mol. compds. of **chromene** compds., e.g. I (R1-2 = (un)substituted aryl; R1 and/or R2 = (un)substituted amino-containing Ph; X = (un)substituted bivalent group forming condensed ring) and aromatic compds. (mol. weight 70-150) are claimed. The materials are manufactured by contact reaction of aromatic compds. (mol. weight 70-150) and I.  
\*\*\*Photochromic\*\*\* optical materials containing the materials, their preparation by hardening of polymerizable monomers containing the materials dissolved therein, and \*\*\*photochromic\*\*\* lenses comprising laminates of the optical materials are also claimed.

SUPPL. TERM: **photochromic** material **chromene** arom mol  
compd; lens **photochromic** mol compd photocurable  
polymer dispersed

INDEX TERM: Molecular association  
**Photochromic** materials  
(manufacture of highly soluble aromatic compound-**chromene**  
mol. compds. as **photochromic** materials for uses  
in plastic lenses)

INDEX TERM: Lenses  
(**photochromic**; manufacture of highly soluble aromatic  
compound-**chromene** mol. compds. as  
**photochromic** materials for uses in plastic  
lenses)

INDEX TERM: 154951-58-3P, Glycidyl methacrylate-2-hydroxyethyl  
methacrylate-tetraethylene glycol dimethacrylate-triethylene  
glycol dimethacrylate copolymer  
ROLE: IMF (Industrial manufacture); TEM (Technical or  
engineered material use); PREP (Preparation); USES (Uses)  
(manufacture of highly soluble aromatic compound-**chromene**  
mol. compds. as **photochromic** materials for uses  
in plastic lenses)

INDEX TERM: 159596-05-1 **308283-60-5** 313049-73-9  
431948-60-6  
ROLE: RCT (Reactant); RACT (Reactant or reagent)  
(manufacture of highly soluble aromatic compound-**chromene**  
mol. compds. as **photochromic** materials for uses  
in plastic lenses)

INDEX TERM: 108-88-3D, Toluene, compds.  
ROLE: TEM (Technical or engineered material use); USES  
(Uses)  
(mol. compound with **chromene** derivs.; manufacture of  
highly soluble aromatic compound-**chromene** mol. compds.  
as **photochromic** materials for uses in plastic  
lenses)

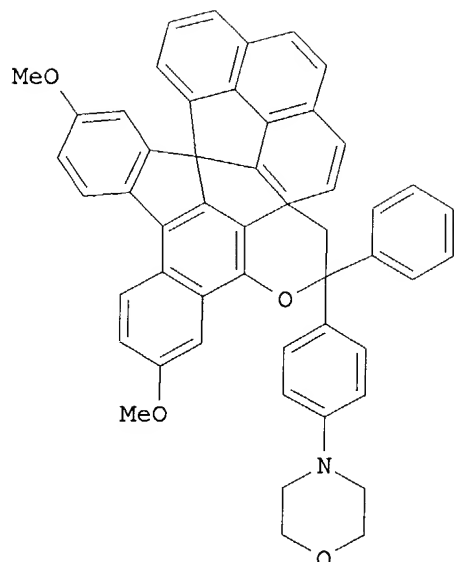
INDEX TERM: **308283-35-4P** 312969-97-4P  
ROLE: IMF (Industrial manufacture); TEM (Technical or  
engineered material use); PREP (Preparation); USES (Uses)  
(mol. compound with toluene; manufacture of highly soluble  
aromatic

compound-**chromene** mol. compds. as  
**photochromic** materials for uses in plastic  
lenses)

L5 ANSWER 8 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN  
ACCESSION NUMBER: 2002:270670 CAPLUS  
DOCUMENT NUMBER: 136:310847  
ENTRY DATE: Entered STN: 11 Apr 2002  
TITLE: Curable **photochromic** compositions with good  
releasability and hard coat adhesion  
INVENTOR(S): Hyakuta, Junji; Otani, Toshiaki  
PATENT ASSIGNEE(S): Tokuyama Corp., Japan  
SOURCE: Jpn. Kokai Tokkyo Koho, 20 pp.  
CODEN: JKXXAF  
DOCUMENT TYPE: Patent  
LANGUAGE: Japanese  
INT. PATENT CLASSIF.:  
MAIN: C08F236-22  
SECONDARY: C08F002-44; C09K009-02  
CLASSIFICATION: 38-3 (Plastics Fabrication and Uses)  
Section cross-reference(s): 73  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

| PATENT NO.   | KIND | DATE     | APPLICATION NO.  | DATE     |
|--|------|----------|------------------|----------|
| JP 2002105139  | A2   | 20020410 | JP 2000-299464   | 20000929 |
| WO 2002028930  | A1   | 20020411 | WO 2001-JP7959   | 20010913 |
| W: AU, US  |      |          |                  |          |
| RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL,<br>PT, SE, TR    |      |          |                  |          |
| AU 2001086229  | A5   | 20020415 | AU 2001-86229    | 20010913 |
| EP 1293522   | A1   | 20030319 | EP 2001-965625   | 20010913 |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,<br>IE, FI, CY, TR |      |          |                  |          |
| US 2003036579  | A1   | 20030220 | US 2002-148319   | 20020529 |
| PRIORITY APPLN. INFO.:   |      |          | JP 2000-299464 A | 20000929 |
|  |      |          | WO 2001-JP7959 W | 20010913 |

GRAPHIC IMAGE:



I

# ABSTRACT:

The compns. useful for eyeglass lens, etc., comprise (A) trimethylolpropane trimethacrylate-type monomers, (B)  $\gamma$ -methacryloylpropyltrimethoxysilane-type silyl monomers, (C) other radically polymerizable monomers, and (D) \*\*\*photochromic\*\*\* compds. 0.0001-10 parts (based on 100 parts monomers). Cast polymerization of trimethylolpropane trimethacrylate 20,  $\gamma$ -methacryloylpropyltrimethoxysilane 5, 2,2-bis(4-methacryloyloxyethoxyphenyl)propane 25, tetraethylene glycol dimethacrylate 30, polyethylene glycol diacrylate 3, glycidyl methacrylate 10,  $\alpha$ -methylstyrene 6,  $\alpha$ -methylstyrene dimer 1, **chromene I** 0.03 and Perbutyl ND 1 part in a glass cell gave a test piece showing  $\lambda_{\max}$  610 nm, good durability, releasability, and hard coat adhesion.

## SUPPL. TERM:

**photochromic** molding releasability hard coat adhesion; trimethylolpropane trimethacrylate eyeglass lens **photochromic** compn; methacryloylpropyltrimethoxysilane eyeglass lens **photochromic** compn

## INDEX TERM:

Polyoxyalkylenes, uses  
ROLE: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses) (acrylic; curable **photochromic** compns. for eyeglass lens with good releasability and hard coat adhesion)

## INDEX TERM:

**Photochromic** materials  
(curable **photochromic** compns. with good releasability and hard coat adhesion)

## INDEX TERM:

Lenses  
(eyeglass; curable **photochromic** compns. with good releasability and hard coat adhesion)

## INDEX TERM:

409361-25-7P 409361-26-8P 409361-27-9P 409361-28-0P  
409361-29-1P 409361-31-5P

ROLE: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses) (curable **photochromic** compns. for eyeglass lens with good releasability and hard coat adhesion)

## INDEX TERM:

**308830-08-2** 312969-97-4 **321861-35-2**  
**356061-14-8** 378235-36-0 **409361-33-7**  
**409361-34-8**

ROLE: MOA (Modifier or additive use); TEM (Technical or

engineered material use); USES (Uses)  
(curable **photochromic** compns. for eyeglass lens  
with good releasability and hard coat adhesion)

L5 ANSWER 9 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN  
ACCESSION NUMBER: 2001:617991 CAPLUS  
DOCUMENT NUMBER: 135:203059  
ENTRY DATE: Entered STN: 24 Aug 2001  
TITLE: **Photochromic chromene** compound  
INVENTOR(S): Izumi, Shinobu; Kawabata, Yuichiro; Takeda, Yasuko;  
Momoda, Junji; Nagoh, Hironobu  
PATENT ASSIGNEE(S): Tokuyama Corporation, Japan  
SOURCE: PCT Int. Appl., 118 pp.  
CODEN: PIXXD2  
DOCUMENT TYPE: Patent  
LANGUAGE: Japanese  
INT. PATENT CLASSIF.:  
MAIN: C07D311-94  
SECONDARY: C07D405-10; C07D409-04; C07D451-02; C07D453-02;  
C07D491-20; C07D491-107; C07D495-10; C09K009-02;  
G03C001-73; G02B001-04; G02B005-23  
CLASSIFICATION: 74-9 (Radiation Chemistry, Photochemistry, and  
Photographic and Other Reprographic Processes)  
Section cross-reference(s): 27  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

| PATENT NO.  | KIND | DATE     | APPLICATION NO. | DATE        |
|---|------|----------|-----------------|-------------|
| WO 2001060811   | A1   | 20010823 | WO 2000-JP9419  | 20001228    |
| W: AU, JP, US   |      |          |                 |             |
| RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL,<br>PT, SE, TR |      |          |                 |             |
| AU 2001022307   | A5   | 20010827 | AU 2001-22307   | 20001228    |
| EP 1184379  | A1   | 20020306 | EP 2000-985992  | 20001228    |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,<br>IE, FI      |      |          |                 |             |
| US 2003096117   | A1   | 20030522 | US 2001-958843  | 20011015    |
| US 6723859  | B2   | 20040420 |                 |             |
| US 2004014995   | A1   | 20040122 | US 2003-603686  | 20030626    |
| PRIORITY APPLN. INFO.:  |      |          | JP 2000-42682   | A 20000221  |
|   |      |          | WO 2000-JP9419  | W 20001228  |
|   |      |          | US 2001-958843  | A3 20011015 |

OTHER SOURCE(S): MARPAT 135:203059

ABSTRACT:

A novel **chromene** compound having various substituents which, even when dispersed in a polymer matrix, is highly sensitive in color development to attain a high color d. and has a high fading rate, and which colors little upon deterioration and has excellent **photochromic** durability; a  
\*\*\*photochromic\*\*\* material containing the **chromene** compound; and other applications of the **chromene** compound

SUPPL. TERM: **photochromic chromene** compd  
INDEX TERM: **Photochromic** materials  
(**photochromic chromene** compound)  
INDEX TERM: 317817-61-1P 317817-65-5P  
356060-93-0P 356060-94-1P  
356060-95-2P 356060-96-3P  
356060-97-4P 356060-98-5P  
356060-99-6P 356061-00-2P  
356061-01-3P 356061-02-4P  
356061-03-5P 356061-04-6P

356061-05-7P 356061-06-8P 356061-07-9P  
 356061-08-0P 356061-09-1P  
 356061-10-4P 356061-11-5P  
 356061-12-6P 356061-13-7P  
 356061-14-8P 356061-15-9P  
 356061-16-0P 356061-17-1P  
 356061-18-2P 356061-19-3P  
 356061-20-6P 356061-21-7P  
 356061-22-8P 356061-23-9P  
 356061-24-0P 356061-25-1P  
 356061-26-2P 356061-27-3P  
 356061-28-4P 356061-29-5P  
 356061-30-8P 356061-31-9P  
 356061-32-0P 356061-33-1P  
 356061-34-2P 356061-35-3P  
 356061-36-4P 356061-37-5P  
 356061-38-6P 356061-39-7P  
 356061-40-0P 356061-41-1P  
 356061-42-2P 356061-43-3P  
 356061-44-4P 356061-45-5P  
 356061-46-6P 356061-47-7P  
 356061-48-8P 356061-49-9P  
 356061-50-2P 356061-51-3P  
 356061-52-4P 356061-53-5P  
 356061-54-6P 356061-55-7P  
 356061-56-8P 356061-57-9P  
 356061-58-0P 356061-59-1P  
 356061-60-4P 356061-61-5P  
 356061-62-6P 356061-63-7P  
 356061-64-8P 356061-65-9P 356061-66-0  
 P 356061-67-1P 356061-68-2P  
 356061-69-3P 356061-70-6P  
 356061-71-7P 356061-72-8P  
 356061-73-9P 356061-74-0P

ROLE: PRP (Properties); SPN (Synthetic preparation); PREP  
 (Preparation)

(**photochromic chromene** compound)

|             |             |             |             |             |
|-------------|-------------|-------------|-------------|-------------|
| INDEX TERM: | 71228-44-9  | 101597-25-5 | 118965-01-8 | 194940-93-7 |
|             | 214746-70-0 | 263026-73-9 | 263026-74-0 | 308283-51-4 |
|             | 317817-59-7 | 317817-64-4 | 356060-92-9 | 356061-75-1 |
|             | 356061-76-2 | 356061-77-3 | 356061-78-4 | 356061-79-5 |
|             | 356061-80-8 | 356061-81-9 | 356061-82-0 | 356061-83-1 |
|             | 356061-84-2 | 356061-85-3 | 356061-86-4 | 356061-87-5 |
|             | 356061-88-6 | 356061-89-7 | 356061-90-0 | 356061-91-1 |
|             | 356061-92-2 | 356061-93-3 | 356061-94-4 | 356061-95-5 |
|             | 356061-96-6 | 356061-97-7 | 356061-98-8 | 356061-99-9 |
|             | 356062-00-5 | 356062-01-6 | 356062-02-7 | 356062-03-8 |
|             | 356062-04-9 | 356062-05-0 | 356062-06-1 | 356062-07-2 |
|             | 356062-08-3 | 356062-10-7 | 356062-11-8 | 356062-12-9 |
|             | 356062-13-0 | 356062-14-1 | 356062-15-2 | 356062-16-3 |
|             | 356062-17-4 | 356062-18-5 | 356062-19-6 | 356062-20-9 |
|             | 356062-21-0 | 356062-22-1 | 356062-23-2 | 356062-24-3 |
|             | 356062-25-4 | 356062-26-5 | 356062-27-6 | 356062-28-7 |
|             | 356062-29-8 | 356062-30-1 | 356062-31-2 | 356062-32-3 |
|             | 356062-33-4 | 356062-34-5 | 356062-35-6 | 356062-36-7 |
|             | 356062-37-8 | 356062-38-9 | 356062-39-0 | 356062-40-3 |
|             | 356062-41-4 | 356062-42-5 | 356062-43-6 | 356062-44-7 |

ROLE: RCT (Reactant); RACT (Reactant or reagent)

(**photochromic chromene** compound)

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS  
 RECORD.

REFERENCE(S): (1) Optische, W; JP 2000034418 A CAPLUS

- (2) Optische, W; EP 987260 A1 CAPLUS
- (3) Optische, W; DE 19902771 A1 1999 CAPLUS
- (4) Optische, W; WO 012384 A1 2001
- (5) Tokuyama Corporation; WO 0071544 A1 2000 CAPLUS
- (6) Tokuyama Corporation; EP 1054010 A1 2000 CAPLUS
- (7) Tokuyama Corporation; JP 2000344762 A 2000 CAPLUS
- (8) Tokuyama Corporation; JP 200111066 A 2001

L5 ANSWER 10 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2001:290840 CAPLUS

DOCUMENT NUMBER: 134:303097

ENTRY DATE: Entered STN: 25 Apr 2001

TITLE: **Photochromic chromene** compounds  
exhibiting low initial coloring and optical materials  
therewith

INVENTOR(S): Nago, Hironobu; Momota, Junji

PATENT ASSIGNEE(S): Tokuyama Corp., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 19 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

INT. PATENT CLASSIF.:

MAIN: C07D311-92

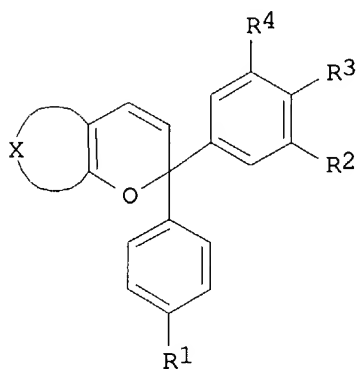
SECONDARY: C07D311-94; C09K009-02; G02B005-23; G03C001-73

CLASSIFICATION: 74-9 (Radiation Chemistry, Photochemistry, and  
Photographic and Other Reprographic Processes)  
Section cross-reference(s): 27, 38, 73

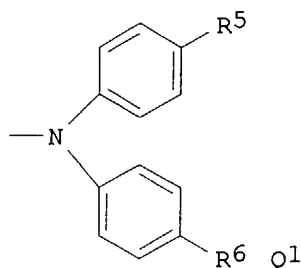
FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO.             | KIND              | DATE     | APPLICATION NO. | DATE     |
|------------------------|-------------------|----------|-----------------|----------|
| JP 2001114775          | A2                | 20010424 | JP 1999-296614  | 19991019 |
| PRIORITY APPLN. INFO.: |                   |          | JP 1999-296614  | 19991019 |
| OTHER SOURCE(S):       | MARPAT 134:303097 |          |                 |          |
| GRAPHIC IMAGE:         |                   |          |                 |          |



I



Q1

# ABSTRACT:

The compds., useful for eyeglasses, have skeletons of I [R1 = Q1 (R5, R6 = H, CF3, cyano, etc.), NR7R8 (R7, R8 = H, alkyl, CF3, cyano, etc.); R2-4 = H, alkoxy, halo, CF3, trifluoromethoxy; X = bivalent condensed polycycles].

SUPPL. TERM:

**photochromic chromene** initial coloring  
low eyeglass; hydroxymorpholinonaphthalene propargyl alc  
reacted **photochromic chromene**



INDEX TERM: **Photochromic materials**  
 (**photochromic chromene** compds.  
 exhibiting low initial coloring for **photochromic**  
 optical materials)

INDEX TERM: Eyeglasses  
 (**photochromic; photochromic**  
**chromene** compds. exhibiting low initial coloring  
 for **photochromic** optical materials)

INDEX TERM: 159596-05-1P  
 ROLE: PNU (Preparation, unclassified); RCT (Reactant); PREP  
 (Preparation); RACT (Reactant or reagent)  
 (in preparation of **chromene** compds. exhibiting good  
**photochromic** property with low initial coloring)

INDEX TERM: 110-91-8, Morpholine, reactions 135-19-3, 2-Naphthol,  
 reactions 484-17-3, 9-Phenanthrenol 7782-50-5, Chlorine,  
 reactions 51936-79-9 159596-01-7 308283-41-2  
 308283-44-5 334829-91-3 334829-92-4 334829-93-5  
 334829-94-6 334829-95-7 334829-96-8 334829-97-9  
 334829-98-0 334829-99-1  
 ROLE: RCT (Reactant); RACT (Reactant or reagent)  
 (in preparation of **chromene** compds. exhibiting good  
**photochromic** property with low initial coloring)

INDEX TERM: 334829-80-0P 334829-82-2P 334829-84-4P 334829-85-5P  
 334829-86-6P 334829-87-7P 334829-88-8P  
**334829-89-9P 334829-90-2P**  
 ROLE: PNU (Preparation, unclassified); PRP (Properties); TEM  
 (Technical or engineered material use); PREP (Preparation);  
 USES (Uses)  
 (**photochromic chromene** compds.  
 exhibiting low initial coloring for **photochromic**  
 optical materials)

INDEX TERM: 154951-58-3P, Glycidyl methacrylate-2-hydroxyethyl  
 methacrylate-tetraethylene glycol dimethacrylate-triethylene  
 glycol dimethacrylate copolymer  
 ROLE: PNU (Preparation, unclassified); TEM (Technical or  
 engineered material use); PREP (Preparation); USES (Uses)  
 (**photochromic chromene** compds.  
 exhibiting low initial coloring for **photochromic**  
 optical materials)

L5 ANSWER 11 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2001:40100 CAPLUS  
 DOCUMENT NUMBER: 134:93390  
 ENTRY DATE: Entered STN: 17 Jan 2001  
 TITLE: **Photochromic chromene** compound  
 INVENTOR(S): Kawabata, Yuichiro; Momota, Junji  
 PATENT ASSIGNEE(S): Tokuyama Corp., Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 17 pp.  
 CODEN: JKXXAF

DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese

INT. PATENT CLASSIF.:

MAIN: C07D311-92  
 SECONDARY: C07D491-107; C07D493-10; C09K009-02  
 CLASSIFICATION: 74-9 (Radiation Chemistry, Photochemistry, and  
 Photographic and Other Reprographic Processes)  
 Section cross-reference(s): 27

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO. | KIND | DATE  | APPLICATION NO. | DATE  |
|------------|------|-------|-----------------|-------|
| -----      | ---- | ----- | -----           | ----- |

JP 2001011066 A2 20010116 JP 1999-188902 19990702  
PRIORITY APPLN. INFO.: JP 1999-188902 19990702  
OTHER SOURCE(S): MARPAT 134:93390

ABSTRACT:

The **photochromic chromene** compound has the main structure of an indene ring having a specific substituent on the 1-position. The \*\*\*chromene\*\*\* compound shows the rapid discoloring speed and little residual color even after repeated coloring and discoloring.

SUPPL. TERM: **photochromic chromene** compd indene  
INDEX TERM: **Photochromic materials**  
(**photochromic chromene** compound)  
INDEX TERM: 317817-52-0P 317817-54-2P 317817-56-4P  
317817-58-6P 317817-61-1P 317817-63-3P  
317817-65-5P 317817-67-7P  
317817-69-9P 317817-71-3P  
317817-73-5P  
ROLE: PRP (Properties); SPN (Synthetic preparation); TEM  
(Technical or engineered material use); PREP (Preparation);  
USES (Uses)

(**photochromic chromene** compound)  
INDEX TERM: 118965-01-8 194940-93-7 214746-69-7 317817-51-9  
317817-53-1 317817-55-3 317817-57-5 317817-59-7  
317817-60-0 317817-62-2 317817-64-4 317817-66-6  
317817-68-8 317817-70-2 317817-72-4  
ROLE: RCT (Reactant); RACT (Reactant or reagent)  
(**photochromic chromene** compound)

L5 ANSWER 12 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2001:38489 CAPLUS  
DOCUMENT NUMBER: 134:108075  
ENTRY DATE: Entered STN: 16 Jan 2001  
TITLE: **Photochromic chromene** compound  
INVENTOR(S): Momota, Junji; Komuro, Yasuko  
PATENT ASSIGNEE(S): Tokuyama Corp., Japan  
SOURCE: Jpn. Kokai Tokkyo Koho, 18 pp.  
CODEN: JKXXAF

DOCUMENT TYPE: Patent  
LANGUAGE: Japanese

INT. PATENT CLASSIF.:

MAIN: C07D311-94  
SECONDARY: C09K009-02  
CLASSIFICATION: 74-9 (Radiation Chemistry, Photochemistry, and  
Photographic and Other Reprographic Processes)  
Section cross-reference(s): 27

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO.             | KIND | DATE     | APPLICATION NO. | DATE     |
|------------------------|------|----------|-----------------|----------|
| JP 2001011067          | A2   | 20010116 | JP 1999-188146  | 19990701 |
| PRIORITY APPLN. INFO.: |      |          | JP 1999-188146  | 19990701 |

ABSTRACT:

The **photochromic chromene** compound has the main structure of an indene ring which has an alkynyl group on the 1-position. The \*\*\*chromene\*\*\* compound shows the good color concentration, the rapid discoloring speed, and little coloring even after long service-time.

SUPPL. TERM: **photochromic chromene** compd indene  
INDEX TERM: **Photochromic materials**  
(**photochromic chromene** compound)  
INDEX TERM: 308830-06-0P 308830-10-6P

308830-14-0P 308830-42-4P

318487-87-5P 318487-88-6P

318487-92-2P 318487-94-4P

318487-96-6P 318487-99-9P

ROLE: PRP (Properties); SPN (Synthetic preparation); TEM  
(Technical or engineered material use); PREP (Preparation);  
USES (Uses)

INDEX TERM: (photochromic chromene compound)  
1066-26-8, Sodium acetylde 71228-44-9 78250-21-2  
80826-37-5 118965-01-8 194940-93-7 255377-08-3  
308283-51-4 318487-84-2 318487-86-4  
318487-90-0

ROLE: RCT (Reactant); RACT (Reactant or reagent)  
(photochromic chromene compound)

INDEX TERM: 308283-58-1P 308283-60-5P  
313049-36-4P 313049-41-1P  
318487-89-7P 318487-91-1P  
318487-93-3P 318487-95-5P  
318487-97-7P 318487-98-8P  
ROLE: RCT (Reactant); SPN (Synthetic preparation); PREP  
(Preparation); RACT (Reactant or reagent)  
(photochromic chromene compound)

L5 ANSWER 13 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2000:866427 CAPLUS

DOCUMENT NUMBER: 134:49256

ENTRY DATE: Entered STN: 12 Dec 2000

TITLE: New **chromene** compound for

**photochromic** material  
Kawabata, Yuichiro; Momota, Junji

PATENT ASSIGNEE(S): Tokuyama Corp., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 22 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

INT. PATENT CLASSIF.:

MAIN: C07D311-94

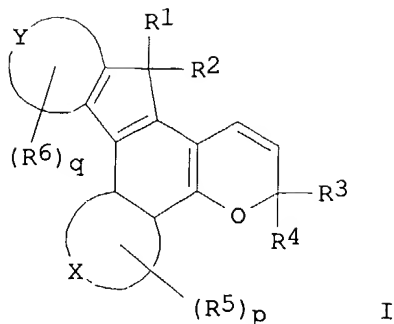
SECONDARY: C07D493-04; C07D493-10; C07D495-10; C07D495-20;  
C09K009-02

CLASSIFICATION: 74-9 (Radiation Chemistry, Photochemistry, and  
Photographic and Other Reprographic Processes)  
Section cross-reference(s): 27, 42, 73

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO.             | KIND   | DATE      | APPLICATION NO. | DATE     |
|------------------------|--------|-----------|-----------------|----------|
| JP 2000344762          | A2     | 20001212  | JP 1999-154272  | 19990601 |
| PRIORITY APPLN. INFO.: |        |           | JP 1999-154272  | 19990601 |
| OTHER SOURCE(S):       | MARPAT | 134:49256 |                 |          |
| GRAPHIC IMAGE:         |        |           |                 |          |



**ABSTRACT:**

The new **chromene** compound is represented by a general formula I (X, Y = atoms for forming aromatic hydrocarbon or unsatd. heterocycle; R1, R2 = fused ring, H, OH, alkyl, etc.; R3, R4 = aryl, heteroaryl, etc.; R5 = OH, alkyl, etc.; R6 = OH, alkyl, etc.; p = 0-3; q = 0-3). The **chromene** compound shows excellent **photochromic** properties.

SUPPL. TERM: **chromene** compd prepn **photochromic** material

INDEX TERM: Coating materials  
Lenses  
Photoimaging materials  
(**photochromic**; new **chromene** compound for **photochromic** material)

INDEX TERM: **Photochromic** materials  
(photoimaging; new **chromene** compound for **photochromic** material)

INDEX TERM: 313049-39-7P 313049-40-0P  
313049-43-3P 313049-47-7P  
313049-50-2P 313049-52-4P  
313049-55-7P 313049-57-9P 313049-60-4P  
313049-62-6P 313049-65-9P 313049-67-1P  
313049-69-3P 313049-71-7P 313049-74-0P  
ROLE: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)  
(preparation of **chromene** compound for **photochromic** material)

INDEX TERM: 13390-92-6 82214-69-5 308283-54-7  
308283-58-1 312730-49-7 313049-36-4  
313049-37-5 313049-41-1 313049-42-2  
313049-44-4 313049-46-6 313049-48-8  
313049-49-9 313049-51-3 313049-53-5  
313049-54-6 313049-56-8 313049-58-0 313049-61-5  
313049-63-7 313049-64-8 313049-66-0  
313049-68-2 313049-72-8 313049-73-9  
ROLE: RCT (Reactant); RACT (Reactant or reagent)  
(preparation of **chromene** compound for **photochromic** material)

INDEX TERM: 313049-38-6P  
ROLE: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)  
(preparation of **chromene** compound for **photochromic** material)

L5 ANSWER 14 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN  
ACCESSION NUMBER: 2000:842135 CAPLUS  
DOCUMENT NUMBER: 134:17504  
ENTRY DATE: Entered STN: 01 Dec 2000

TITLE: Preparation of **chromene** compounds as  
**photochromic** substances  
 INVENTOR(S): Momoda, Junji; Komuro, Yasuko  
 PATENT ASSIGNEE(S): Tokuyama Corporation, Japan  
 SOURCE: PCT Int. Appl., 79 pp.  
 CODEN: PIXXD2  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 INT. PATENT CLASSIF.:  
 MAIN: C07D493-10  
 SECONDARY: G03C001-73  
 CLASSIFICATION: 28-17 (Heterocyclic Compounds (More Than One Hetero  
 Atom))  
 Section cross-reference(s): 35, 74  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

| PATENT NO.   | KIND | DATE             | APPLICATION NO. | DATE       |
|--|------|------------------|-----------------|------------|
| WO 2000071544  | A1   | 20001130         | WO 2000-JP3200  | 20000518   |
| W: AU, JP, US  |      |                  |                 |            |
| RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE |      |                  |                 |            |
| EP 1116723   | A1   | 20010718         | EP 2000-929795  | 20000518   |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI  |      |                  |                 |            |
| US 6469076   | B1   | 20021022         | US 2001-744305  | 20010430   |
| PRIORITY APPLN. INFO.:   |      |                  | JP 1999-144072  | A 19990524 |
|  |      |                  | WO 2000-JP3200  | W 20000518 |
| OTHER SOURCE(S):   |      | MARPAT 134:17504 |                 |            |
| GRAPHIC IMAGE:   |      |                  |                 |            |

\* STRUCTURE DIAGRAM TOO LARGE FOR DISPLAY - AVAILABLE VIA OFFLINE PRINT \*

#### ABSTRACT:

**Photochromic** compds., developing colors of neutral tints by themselves and exhibiting high fading speeds and excellent durability of photochromism, are prepared. The compds. are novel **chromene** compds. having a basic structure which is constituted of an indene ring bearing in a state bonded to the 1-position through a spiro union a fused ring composed of a pyran ring and a specific divalent group bonded to the 5- and 6-position carbon atoms of the pyran ring, a fused ring composed of a **chromene** ring and a specific divalent group bonded to the 5- and 6-position carbon atoms of the **chromene** ring, and a specific substituent bonded to the 2-position carbon atom of the **chromene** ring, for example, the compound represented by structural formula [I; ring A, ring B = bivalent aromatic hydrocarbon or unsatd. heterocyclic group; R1, R2, R3, R4 = alkyl, HO, alkoxy, aralkoxy, (un)substituted NH2, cyano, NO2, (un)substituted aryl, halo, CF3, aralkyl, (un)substituted heterocyclyl optionally fused to aromatic hydrocarbon or heterocyclic ring; p, q, m, n = 0-3; R5, R6 = (CR8:CH)rR7, (C.tplbond.C)mR9; R7, R9 = (un)substituted aryl, heteroaryl; R8 = H, alkyl, halo; n = 1-3]. A **photochromic** optical material, **photochromic** material, and **photochromic** polymerizable composition containing I are also claimed. Thus, **chromene** derivative (II) and 2-naphthol were dissolved in toluene and stirred with p-toluenesulfonic acid at room temperature for 1 h to give 33% title compound (III). Nonaethylene glycol dimethacrylate-triethylene glycol dimethacrylate-glycidyl methacrylate-2-hydroxyethyl methacrylate copolymer containing III exhibited gray coloration with initial coloration  $\epsilon$  of 0.03, fading speed of 2.2 min, and excellent durability of photochromism at

$\lambda_{\text{max}}$  of 465 nm.

SUPPL. TERM: **chromene** prepn **photochromic** substance  
INDEX TERM: Acrylic polymers, preparation  
ROLE: PRP (Properties); SPN (Synthetic preparation); TEM  
(Technical or engineered material use); PREP (Preparation);  
USES (Uses)

(containing **chromene** derivs.; preparation of  
**chromene** compds. as **photochromic**  
substances)

INDEX TERM: **Photochromic** materials  
(preparation of **chromene** compds. as  
**photochromic** substances)

INDEX TERM: 308283-39-8P, Nonaethylene glycol dimethacrylate-triethylene  
glycol dimethacrylate-glycidyl methacrylate-2-hydroxyethyl  
methacrylate copolymer

ROLE: PRP (Properties); SPN (Synthetic preparation); TEM  
(Technical or engineered material use); PREP (Preparation);  
USES (Uses)

(containing **chromene** derivs.; preparation of  
**chromene** compds. as **photochromic**  
substances)

INDEX TERM: **308830-08-2P 308830-12-8P**  
**308830-16-2P 308830-18-4P**  
**308830-23-1P 308830-27-5P**  
**308830-31-1P 308830-33-3P**  
**308830-35-5P 308830-37-7P**  
**308830-40-2P 308830-44-6P**  
**308830-48-0P**

ROLE: PRP (Properties); SPN (Synthetic preparation); TEM  
(Technical or engineered material use); PREP (Preparation);  
USES (Uses)

(preparation of **chromene** compds. as  
**photochromic** substances)

INDEX TERM: 90-15-3, 1-Naphthol 135-19-3, 2-Naphthol, reactions  
484-17-3, 9-Phenanthrenol 5111-66-0, 6-Methoxy-2-naphthol  
19393-87-4, 8-Methyl-2-naphthol 30069-65-9,  
3-Phenyl-1-naphthol 57985-68-9, 3-tert-Butyl-1-naphthol  
70227-82-6 159596-05-1, 4-Morpholino-2-naphthol  
**308830-06-0 308830-10-6**  
**308830-14-0 308830-21-9**  
**308830-25-3 308830-28-6**  
**308830-42-4 308830-46-8**  
**308831-07-4**

ROLE: RCT (Reactant); RACT (Reactant or reagent)  
(preparation of **chromene** compds. as  
**photochromic** substances)

REFERENCE COUNT: 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS  
RECORD.

REFERENCE(S): (1) Optische, W; JP 200034418 A  
(2) Optische, W; JP 200034418 A  
(3) Optische, W; EP 987260 A1 CAPLUS  
(4) Optische, W; EP 987260 A1 CAPLUS  
(5) Optische, W; DE 19902771 A1 1999 CAPLUS  
(6) Optische, W; DE 19902771 A1 1999 CAPLUS

L5 ANSWER 15 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2000:830139 CAPLUS

DOCUMENT NUMBER: 134:23564

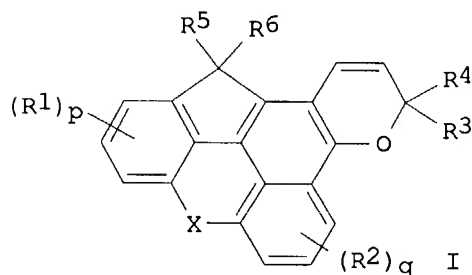
ENTRY DATE: Entered STN: 28 Nov 2000

TITLE: **Photochromic chromene** compound

INVENTOR(S): Matsuoka, Shingo; Momota, Junji

PATENT ASSIGNEE(S): Tokuyama Corp., Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 18 pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 INT. PATENT CLASSIF.:  
 MAIN: C07D311-94  
 SECONDARY: C09K009-02; G03C001-73  
 CLASSIFICATION: 74-9 (Radiation Chemistry, Photochemistry, and  
 Photographic and Other Reprographic Processes)  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

| PATENT NO.             | KIND | DATE             | APPLICATION NO. | DATE     |
|------------------------|------|------------------|-----------------|----------|
| JP 2000327676          | A2   | 20001128         | JP 1999-144074  | 19990524 |
| PRIORITY APPLN. INFO.: |      |                  | JP 1999-144074  | 19990524 |
| OTHER SOURCE(S):       |      | MARPAT 134:23564 |                 |          |
| GRAPHIC IMAGE:         |      |                  |                 |          |



# ABSTRACT:

The **photochromic chromene** compound is represented by general formula I [R1, R2 = H, alkyl, alkoxy, aralkoxy, amino, cyano, aryl, halo, aralkyl, fused heterocycle; p, q = 0-3; R3, R4 = -(C(R8):CH)nR7, -(C.trplbond.C)mR9, aryl, heteroaryl, alkyl; R3 joining together with R4 may form aliphatic or aromatic hydrocarbon ring; R5, R6 = H, alkyl, cycloalkyl, aryl acyl, cyano, halo, etc.; X = O, S, ethylidene, etc.; R7 = aryl, heteroaryl; R8 = H, alkyl, halo; n = 1-3; R9 = aryl, heteroaryl; m = 1-3]. The **photochromic chromene** compound dispersed in a polymer matrix can be used as an **photochromic** optical imaging element. The **photochromic chromene** compound shows excellent properties.

SUPPL. TERM: **photochromic chromene** prepn optical imaging material  
 INDEX TERM: Coating materials  
 Lenses  
 Photoimaging materials  
 (photochromic; preparation of **photochromic chromene** compound suitable for)  
 INDEX TERM: **Photochromic** materials  
 (photoimaging; preparation of **photochromic chromene** compound suitable for)  
 INDEX TERM: **Photochromic** materials  
 (preparation of **photochromic chromene** compound)  
 INDEX TERM: 154951-58-3, Glycidyl methacrylate-2-hydroxyethyl methacrylate-tetraethyleneglycol dimethacrylate-

triethyleneglycol dimethacrylate copolymer  
 ROLE: NUU (Other use, unclassified); USES (Uses)  
 (**chromene photochromic** compound  
 dispersed in matrix of)

INDEX TERM: 100-58-3 703-55-9 82214-69-5, Magnesium,  
 [1,1'-biphenyl]-2-ylbromo- 102164-16-9 194940-93-7  
 309261-08-3 309261-10-7 309261-14-1 309261-16-3  
**309261-20-9**  
 ROLE: RCT (Reactant); RACT (Reactant or reagent)  
 (preparation of **photochromic chromene**  
 compound)

INDEX TERM: **309261-11-8P**  
 ROLE: RCT (Reactant); SPN (Synthetic preparation); PREP  
 (Preparation); RACT (Reactant or reagent)  
 (preparation of **photochromic chromene**  
 compound)

INDEX TERM: **309261-09-4P 309261-12-9P**  
**309261-13-0P 309261-15-2P**  
**309261-17-4P 309261-18-5P**  
**309261-19-6P 309261-21-0P**  
**309261-22-1P 309261-23-2P**  
 ROLE: SPN (Synthetic preparation); PREP (Preparation)  
 (preparation of **photochromic chromene**  
 compound)

L5 ANSWER 16 OF 16 CAPLUS COPYRIGHT 2004 ACS on STN  
 ACCESSION NUMBER: 2000:822708 CAPLUS  
 DOCUMENT NUMBER: 134:5911  
 ENTRY DATE: Entered STN: 24 Nov 2000  
 TITLE: **Photochromic chromene** spiro  
 derivatives and polymerizable compositions containing  
 them  
 INVENTOR(S): Momoda, Junji; Kawabata, Yuichiro  
 PATENT ASSIGNEE(S): Tokuyama Corporation, Japan  
 SOURCE: Eur. Pat. Appl., 45 pp.  
 CODEN: EPXXDW  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 INT. PATENT CLASSIF.:  
 MAIN: C07D311-96  
 SECONDARY: C07D493-10; C08K005-15; G02B005-23  
 CLASSIFICATION: 41-11 (Dyes, Organic Pigments, Fluorescent  
 Brighteners, and Photographic Sensitizers)  
 Section cross-reference(s): 37, 63  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

| PATENT NO.   | KIND | DATE            | APPLICATION NO. | DATE       |
|--|------|-----------------|-----------------|------------|
| EP 1054010   | A1   | 20001122        | EP 2000-304240  | 20000519   |
| EP 1054010   | B1   | 20020724        |                 |            |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,<br>IE, SI, LT, LV, FI, RO |      |                 |                 |            |
| JP 2001192378  | A2   | 20010717        | JP 2000-142655  | 20000516   |
| JP 3522189   | B2   | 20040426        |                 |            |
| US 6340765   | B1   | 20020122        | US 2000-572896  | 20000518   |
| ES 2179005   | T3   | 20030116        | ES 2000-304240  | 20000519   |
| AU 765599  | B2   | 20030925        | AU 2000-35402   | 20000519   |
| PRIORITY APPLN. INFO.:   |      |                 | JP 1999-140836  | A 19990520 |
|  |      |                 | JP 1999-303967  | A 19991026 |
| OTHER SOURCE(S):   |      | MARPAT 134:5911 |                 |            |
| ABSTRACT:  |      |                 |                 |            |



**Photochromic** compds. having high color-developing sensitivity, large fading rate, and good durability of **photochromic** property are characterized by a structure in which a condensed ring having a particular divalent group bonded to carbon atoms at the fourth and fifth positions of a fluoreno group is spiro-bonded to the first position of an indene ring, a particular divalent group is bonded to carbon atoms at the fifth and sixth positions of a **chromene** ring to form a condensed ring, and particular substituents are bonded to a carbon atom at the second position of the \*\*\*chromene\*\*\* ring. Such **photochromic** dyes may be incorporated into a polymer matrix for the production of **photochromic** lenses. Examples of production of 18 **photochromic** dyes were given.

SUPPL. TERM: **photochromic chromene** spiro deriv dye  
prodn

INDEX TERM: **Photochromic** materials  
(dyes; production of **photochromic chromene**  
spiro derivs. and polymerizable compns. containing them)

INDEX TERM: Dyes  
(**photochromic**; production of **photochromic chromene** spiro derivs. and polymerizable compns. containing them)

INDEX TERM: Lenses  
(**photochromic**; production of **photochromic chromene** spiro derivs. for)

INDEX TERM: 308283-10-5P 308283-12-7P  
308283-14-9P 308283-16-1P  
308283-18-3P 308283-20-7P  
308283-22-9P 308283-24-1P  
308283-26-3P 308283-28-5P  
308283-30-9P 308283-32-1P  
308283-33-2P 308283-34-3P  
308283-35-4P 308283-36-5P  
308283-37-6P 308283-38-7P  
ROLE: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)  
(dye; production of **photochromic chromene** spiro derivs. and polymerizable compns. containing them)

INDEX TERM: 308283-39-8P, Glycidyl methacrylate-2-hydroxyethyl methacrylate-nonaethylene glycol dimethacrylate-triethylene glycol dimethacrylate copolymer 308283-40-1P, Glycidyl methacrylate-2-hydroxyethyl methacrylate-nonaethylene glycol dimethacrylate-tetraethylene glycol dimethacrylate-triethylene glycol dimethacrylate copolymer  
ROLE: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)  
(matrix for **photochromic chromene** spiro derivative dyes)

INDEX TERM: 19462-79-4 50548-45-3 118965-01-8 194940-93-7  
214746-69-7 255377-08-3 308283-41-2 308283-42-3  
308283-43-4 308283-44-5 308283-45-6 308283-46-7  
308283-51-4 308283-53-6 308283-54-7  
308283-55-8 308283-56-9 308283-57-0  
308283-58-1 308283-59-2 308283-60-5  
308283-61-6 308283-62-7  
308283-63-8  
ROLE: RCT (Reactant); RACT (Reactant or reagent)  
(starting material; production of **photochromic chromene** spiro derivs.)

REFERENCE COUNT: 2 THERE ARE 2 CITED REFERENCES AVAILABLE FOR THIS RECORD.

REFERENCE(S): (1) Ppg Industries; WO 9614596 A 1996 CAPLUS  
(2) Rodenstock; DE 19902771 A 1999 CAPLUS

$\Rightarrow$